

SCIENCE

FRIDAY, JUNE 29, 1888.

AT A MEETING held at the Mansion House, London, on June 8, in support of a scheme for establishing polytechnic institutes in South London, a speech was delivered by Lord Salisbury, in which he pointed out, that, if the law of "the survival of the fittest" is to hold, there must be a rapid improvement in the human race at no distant day. Lord Salisbury, after passing in review the efforts which have been made in London to meet the demand for technical instruction, concluded as follows: "I have only one more word to say, just to call your attention to another aspect of this case, and to commend it to your efforts. We live in a time when men multiply fast, but apparently the means of supporting them do not multiply as rapidly; when there is vehement competition, and occasionally intervals of deep depression. And if you should look more closely, you will find that one cause, at least, of this phenomenon is that man, as the mere owner of muscle, is being edged out by another and more powerful competitor. Merely as an agent of physical force, as the possessor of the power of labor, the steam-engine is a competitor which drives him easily out of the market. And more and more the mere unskilled labor is being made unnecessary by the development of the forces which mechanical science has discovered. And as the world goes on, you must expect this tendency to increase. You must expect mechanical force to become more varied and more powerful and more cheap, and the competition with human arms and limbs to become more hopeless. But there is one region where the machine can never follow the human being, and that is in the exercise of thought. In skill, in cultivated mind, in the power to adapt the processes of thought to the laws of nature, in all that we call 'skilled labor' of the highest kind,—in that man must always have a monopoly, and need fear no encroachment from the competition of the steam-engine. It is to the development of his powers in that respect that the increase in the means of subsistence, and the opening of new paths of self-support, must be found. On all of us, in whatever position we are, is pressing, as one of the most anxious subjects of public care, the discoveries of methods by which the teeming millions of this country shall be able to maintain themselves in a prosperous, decent, and comfortable condition. We cannot find in their unskilled labor a satisfaction of that want. The difficulties are enhanced by the fact that our neighbors in other countries have been sensible of the superiority which skilled education can confer, and have not been slow to take advantage of it. If we will not be left behind in the race, if we desire to find any satisfactory solution for the deepest and the most inscrutable problem of our time, if we wish our complex community and high civilization to be maintained secure from all the dangers which the presence of unfed, unprosperous, untaught millions must bring upon them, we shall do our utmost to give a healthy and a rapid development to the secondary education of the working-classes."

In commenting on this speech, and on the report of the proceedings as given in the *Times*, *Nature* takes occasion to say, "For many a day, as our readers know, we have been urging the necessity for the establishment of a proper system of technical instruction. The subject is one of such pressing importance that we have returned to it again and again, seeking to present it in many different aspects; and Lord Salisbury's speech and the article in the *Times* may be taken as indications that large classes of the com-

munity have at last begun to understand that the nation has no time to lose in setting about a task which ought long ago to have been most seriously undertaken. Even if the question had little direct relation with economic interests, it would be for many reasons desirable to secure for manual training a place among our educational methods. Attention has hitherto been too exclusively devoted in schools to such knowledge as may be derived from books. It is necessary, from the strictly educational point of view, that teachers should aim at a wider, more direct, and more practical development of the mental powers of their scholars. But other and even more fundamental interests are also concerned. The leading nations of the world, our rivals in industry and trade, have already perceived the benefits to be secured from a thorough mastery, on the part both of employers and employed, of the principles of science as applied to agricultural and manufacturing processes. The result is, that in many of the best markets, where our supremacy as a trading people was formerly unquestioned, we find ourselves at a disadvantage; and it is certain, that, unless we place ourselves on a level with our competitors, we shall have to pass through some very bitter national experiences. The question is really one of life and death for England. It is a question whether in the near future there are or are not to be sufficient employment and remuneration for the vast and growing masses of her population."

THE MODERN TENDENCY of population to drift from the country to towns and cities is well illustrated by some figures published in a recent number of the *Melbourne Argus*. These figures have attracted considerable attention in Australia, where the tendency is particularly marked in the case of Melbourne, Sydney, and Adelaide. In Melbourne the yearly increase in population has been the greatest, the gain during the past three years varying from nineteen thousand to twenty-two thousand; and this increase is apparently still growing. The population of Melbourne and its suburbs is estimated at 400,000, against 250,000 in 1878. During the same time there has also been an increase in Sydney; and it is believed that this city must now be nearly as large as Melbourne, although with due pride the *Melbourne Argus* expresses its belief that the latter city is destined to be the real capital of Australia. This increase in city population has been at the expense of the country districts. The desertion of work at the gold-fields has tended to depopulate some sections, which population has gravitated toward the large cities. In 1861 Melbourne contained one-fourth of the population of the colony of Victoria; in 1881 this proportion had increased to one-third, and it is now two-fifths; and apparently we may soon see the phenomenon of one-half the people of the colony living in the city, and one-half outside of it. Similar conditions practically are true of Sydney and Adelaide. Melbourne at present contains one-seventh of the entire population of Australia. Whether this drifting from country to city will have any effect on the prosperity of the colony remains yet to be seen.

THE THREE AMERICAS PERMANENT EXHIBITION.

THE heartiness with which both Houses of Congress have dealt with the projectors of the 'Three Americas Permanent Exhibition' that it is proposed to establish in Washington in 1892 as a part of the celebration of the discovery of America by Columbus, insures its success. While the subject was under consideration by the House Committee on Commerce, Major J. W. Powell, director of the United States Geological Survey, was invited to address the

committee on the archæological importance of such an exhibition. His remarks set forth more forcibly than has been done elsewhere the advancement to this branch of science that is likely to result from such an exhibition, and the importance of securing the material for it at once. The copious extracts given below will be found interesting:—

“The value of great national fairs or expositions has been abundantly shown by the history of such enterprises, alike in America and in Europe. A great national fair is a stupendous object-lesson in industrial civilization.

“The discovery of America is the event which it is designed to celebrate, and its importance is unparalleled in the history of human progress. At that time a continent was found peopled by savages and barbarians, who did not occupy the land, but who were scattered along the water-courses and shores in little tribes far distant from one another. In their ignorance the beautiful earth, with all its potential gifts for civilized man, was but a hunting-ground, a berry-patch, a tobacco-garden, and a battle-field. But the discovery of this new world gave North and South America to the plough, the mine, the workshop, the highway, and the market. A new world was delivered to civilized man as a theatre for new and highly developed industries, and, better than all, as a theatre for new and highly developed institutions, founded upon principles that recognize a wider liberty and more just equality, and a fraternity that embraces a greater scope of imperative duties, than had previously been recognized in the history of man. This great gift to mankind was not the result of accident through the drifting of tempest-tossed sailors from far-off Asia to the golden strands of the West; it was not the gift of chance through the wandering of barbaric Norsemen to the bleak lands of the north-east coast. Civilization discovered America by the light of science. Columbus, a great scholar, a scientific investigator, a man whose insight penetrated to the great secrets of nature in the light of the science of his time,—which was indeed but dim,—by means of one of the grandest scientific inductions in history, accepted the conclusion that the earth is a sphere, and with a sublime faith in scientific inductions he sailed into an unknown sea, inhabited by the monsters of mythology, and beset with the dangers of superstitious credulity, and through this ignorance he sailed away until he discovered the new land; and the inductions of science were verified by the appearance of continents and islands, from which great mountains reared their tops into the heavens. There, too, great lakes were found whose billows were destined to rock the commerce of many peoples, and there great rivers were revealed upon whose turbulent currents the navies of industry now ride. To celebrate the discovery of America by Columbus is to celebrate the greatest event of human history.

“But it is not my task to speak of the value to civilization of the proposed exposition, nor of the importance of the event which it is designed to celebrate; nor even to show that such a celebration would be signally appropriate to the people who are the chief beneficiaries of that great scientific discovery, but simply to set forth the extent to which the great exposition may be made interesting and instructive to the people by making an exhibit of the archæology of the New World.

“The *débris* of forgotten culture of the world was long held to be refuse, unsightly and loathsome; but the time has arrived when this refuse of uncultured man is esteemed by the enlightened man as the priceless relics of antiquity. The ruins of an ancient city that were worthless a few decades ago, are, by the processes of modern investigation into the history and growth of human culture, transformed into values that nations covet; and civilized men are everywhere throughout the world engaged in exhuming from the ruins of ancient cities the treasures of history. Societies are organized for the collection of the material, and colleges and universities are engaged in its investigation, and the libraries of the world are daily enriched with the volumes of this new learning.

“The events of history that are recorded by contemporaneous writers are colored with prejudice and blurred with ignorance; but the records that are preserved in the imperishable works of man are not tainted with baneful inspiration and false statement, but tell the truth, and nothing but the truth. In the past, history was the theme for literary exploration; in the present, history is the

theme of profound investigation; and history has become a science because it is founded upon archæology. It is thus that the ruins of a temple, a tower buried in its own *débris*, an inscription on a rock, a bronze spear, a stone knife, or a potsherd, has a value. A mound or a monument is a volume of history, and a ruined city a great library.

“The people who were found in America, the tribes of savages and barbarians, are rapidly being absorbed among the people of civilization. Their history was written; their artisans, their warriors, their statesmen, and their poets are forgotten; but the vestiges of their history, their archæologic records, are widely scattered. They are found buried in ruined towns and villages; they are covered by innumerable mounds of earth that were built as sites for their council-houses, as places for worship, and as cemeteries for their dead; they are found in countless stone-walled graves; they are found in innumerable refuse-heaps, the *débris* of the kitchens of the savage man; they are found in every ploughed field and on every hillside, and scattered over every mountain; and from these sources they must be taken, if we are to reconstruct the ancient history of America. But every dust-laden breeze buries them deeper, every storm of sand serves to hide them more effectually; the furrowing of every field is an agency for their destruction; the working of every road, the construction of every railway, the erection of every building, makes these relics rarer and more valuable; and ere they are lost I beg they may be secured. The whole civilized world is interested in their collection and preservation, and the people of other lands are gathering and carrying them away by cargoes to enrich the museums and the great universities and splendid capitals of Europe; while in America only a few quiet students have become interested in these materials of American history, and until within a few years we have been almost wholly neglectful of things which by time are becoming more and more valuable.

“The wealth and variety of the materials of American history are but little appreciated. The people who inhabited the American continent before its discovery were not all of one race, but of many. In North America alone there were more than seventy-five distinct stocks, having radically distinct languages and mythologies, having independent and diverse institutions, and having diverse and multifarious arts. At the north we have the igloo-dwellers that live by the shores of the frozen seas; farther to the south we have races occupying dwellings made of forest timber; other races wove their habitations of reeds; others built their towns of the clay of mother-earth; and others erected their buildings of stones quarried from the cliffs; while still others hewed themselves habitations in the solid rock. Some dwelt on towering and almost inaccessible cliffs, while other towns were erected among the crags and cinders of extinct volcanoes. Some races were hunters, other races were fishermen, still other races were agriculturists. Some races worshipped the sun and moon and stars, and the gods of the cardinal points; other races made the mountains and the rivers the object of their principal worship; and all worshipped strange mythologic beasts. All of the tribes were organized into bodies politic as bodies of kindred, but the method of organization was multifarious. Many tongues were spoken: harsh consonantal and guttural languages were found in the cold climate of the extreme north and south, vocalic and musical languages were found in the sunny lands of the middle zones. Everywhere the tribes had learned to use picture-writing, and to record events with pictures of men and beasts and many conventional signs. They made tools and implements of stone and bone and shell and horn and wood. They made canoes and boats of bark and logs, they made rafts and basket-boats of weeds, and they made kayaks of skins; and in such crafts they navigated the rivers, the lakes, and the seas. The relics of all these mythologies, religions, institutions, languages, and arts, must be recovered, if we are to preserve the ancient history of America; and the work must be done soon, or they will be lost.

“It is possible to make the four-hundredth anniversary of the discovery of America an occasion to collect and preserve the ancient history of the country, to gather the materials of its archæology, and to put them into one grand international museum at the seat of government of the United States. No other enterprise in

connection with such an American exposition would interest the people more, and no other would be more instructive; and it is proposed or suggested by the Citizens' Committee that a great archæologic exhibit be made, and that each nation in North, Central, and South America be invited to contribute its quota to this great museum. The erection of an appropriate building for this purpose, indestructible by fire, and of sufficient magnitude for the instalment of so great a collection, would cost about five hundred thousand dollars. The archæologic materials to be found within the territory of the United States are in part, but only in small part, collected, and now in the National Museum; and the time is all too short for the completion of this collection, yet by beginning soon it might be well done.

"Such, in brief, is the plan which I was requested to present to you by the Citizens' Committee. It is no less than to collect and put on record for future generations the priceless records that constitute the history of all the native American races. If this can be done, it will be a monument to these native peoples, erected by the invading and conquering and civilizing nations, worthy of Aryan power, and worthy of Aryan culture."

WHEAT-CULTIVATION.

IN the last number of the Journal of the Royal Agricultural Society of England, the most interesting sections are those bearing upon wheat-cultivation. A paper upon the condition of wheat-growing in India, by Dr. George Watt, is followed by an article by Mr. W. E. Bear upon the Indian wheat trade, and in this connection is given an interesting account of modern improvements in corn-milling machinery. These papers throw considerable light upon the difficulties under which the English wheat-grower is struggling, and are commented on by Mr. Wrightington in a recent number of *Nature*.

Dr. Watt and Mr. Bear show the extraordinary extent of the wheat-producing area of the Indian Empire, and the rapidity with which this vast field is being opened up. With reference to the latter point, men in middle life are scarcely likely to realize the fact that in 1853 there were in all only 20½ miles of railway in India, that in 1873 there were 5,695 miles of railway, while in 1887 there were 13,386 miles. Telegraphic communication with India was first opened in 1865, and the opening of the Suez Canal in 1869 was scarcely of less importance in developing her trade, first by shortening the passage, and second by mitigating the risk from wheat-weevil. Another agency has been the development of irrigation-works. We read that "only" 30,000,000 acres have up to date been artificially irrigated; but the appropriateness of the qualifying adverb is rendered evident when it is employed in contrast with the total area of 200,000,000 acres of cultivated ground, and the vast tract of 868,314 square miles which include British India. The normal area under wheat is 26,000,000 acres, and the degree to which this area is likely to be increased depends entirely upon demand and price. Dr. Watt informs us that the Indian cultivator is at all times ready to adapt his courses of cropping to circumstances, and that he will increase or abandon the cultivation of wheat, cotton, or any other crop according to its comparative profitability.

Dr. Watt comes to the conclusion that the Indian wheat trade up to the present time is a perfectly natural one. "The people are exporting only what they specially cultivate for that purpose. The moment better profits can be realized on another crop, they will turn from wheat, without being in the least degree incommoded." If this is the case, the English farmer may well look with envy upon his Indian brother, as he is in the unfortunate position of being compelled to carry on wheat-growing from sheer inability to find a substitute for it in his agricultural economy. Natural though the course of the ryot may be from his point of view, the actual bounty upon wheat, or what amounts to a bounty, consequent upon the fall in value of the rupee, can scarcely be described as natural. This great advantage to the Indian cultivator is clearly brought out by Mr. Bear by the following considerations: First, the Indian ryot gets as much for a quarter of his wheat now as he obtained in 1872. He gets as many rupees, and his rupees are worth as much to him as they were then. In 1871-72 the average exchange value of the

rupee was 1s. 11.12d., whereas recently it has been under 1s. 5d. The price of No. 2 club wheat in Calcutta in 1872 averaged only 2rs. 3s. 1p. per maund, whereas it has for some time past been over 2rs. 10s. Taking 16rs. per quarter (6 maunds) as the price for both periods, then reckoning the exchange value of the rupee for both periods, it is clear that the exchange value of 16rs. in 1872 was equal to 30s. 8d. per quarter, whereas the exchange value of the same sum in 1888 is only 22s. 8d. The fact is that the Indian ryot gets as much for a quarter of wheat now as he did in 1872, in spite of the fall in prices. He gets as many rupees, and his rupees are worth as much to him. This seems to settle the question as to the encouragement given to the ryot as a competitor in wheat-growing with the English farmer. Another point, in all respects discouraging to the cultivation of wheat in England, is found in the complete revolution during the last ten years in corn-milling machinery described by Mr. W. Proctor Baker of Bristol. There has been, in fact, not a mere substitution of one machine for another, or of one series of machines for another, but there has been a change of the principle and mode of procedure. The old system of 'low grinding' by mill-stones, so well calculated for producing flour from soft, tender wheats, such as are produced in England, has been entirely superseded by the Hungarian and American 'gradual reduction' process by 'roller mills.' Not only does this system require the wheat to be dry, hard, and brittle, so as to secure the requisite cracking and gradual reduction, but any thing in the form of a soft or moist wheat is most injurious to the machinery and the products. It rolls into a paste, steam is generated, and the flour works into balls, becomes attached to the rollers, turns sour, and, in fact, throws the entire process out of gear. "It is because of these troubles that owners of mills on a large scale will not employ native wheats in damp seasons. No concession of price is sufficient inducement to them to risk the disorganization of the mill, and probable loss of reputation, by turning out inferior or irregular flour." There are, however, two modes in which these wheats may be used,—first, by submitting them to an artificial drying process; and, second, by mixing them with some description of very brittle wheat, and allowing the mixture to lie for some weeks, until the brittle wheat absorbs some of the moisture of the native wheat, to the mutual advantage of both.

THE MARINE BIOLOGICAL LABORATORY.

THE new laboratory is at Wood's Holl, Mass. A convenient site has been secured close to the shore and to the laboratories of the United States Fish Commission. The laboratory building consists of two stories; the lower story for the use of students receiving instruction, the upper story exclusively for investigators. The laboratory will have boats, dredges, and other collecting apparatus; it will also be supplied with running sea-water, with alcohol and other re-agents, glassware, microtomes, aquaria, etc., a limited number of microscopes for students' use, and a small reference library.

Dr. C. O. Whitman, the distinguished embryologist, has accepted the directorship; and Mr. B. H. Van Vleck, who has had greater experience than any one else in this country in the management of summer seaside biological schools, has been appointed instructor. Under these very competent officers, the laboratory will attract probably more persons than can find accommodation; nevertheless it remains a matter of regret that the announcement of the opening of the laboratory has been so much delayed, owing, we understand, to some unavoidable difficulties in completing the preliminary arrangements.

The laboratory for students will be opened on Tuesday, July 17, at 9 A.M., for a systematic course of six weeks in zoölogy. By permission of the director, students may continue their work until Sept. 20 without additional payment. Microscopes, glass-ware, etc., will be supplied without extra charge except for breakage. Hand lenses, dissecting instruments, drawing materials, etc., may be bought at cost in the laboratory. It is desired that students owning microscopes should bring them.

The fee for this course is twenty-five dollars. The number of students will be limited to twenty-five.

The laboratory for investigators will be opened on July 10, and

will be closed on Sept. 22. It will be equipped as fully as the means permit. Microscopes will not be provided, but it is believed that investigators will find most of their indispensable wants satisfied. The fee for an investigator's table will be fifty dollars for the present season.

Rooms accommodating two persons may be obtained near the laboratory at prices varying from three to four dollars a week, and board from four and a half to seven dollars. Applications for places in the laboratory should be made immediately to the secretary of the Marine Biological Laboratory, Nahant, Mass.

Wood's Holl, owing to the richness of the marine life in the neighboring waters, offers exceptional advantages. It is situated on the north shore of Vineyard Sound, at the entrance to Buzzard's Bay, and may be reached by the Old Colony Railroad (two hours and a half from Boston), or by rail and boat from Fall River and New Bedford.

The new laboratory is intended to continue and extend the work of the laboratory at Annisquam, carried on for six years by the Woman's Education Association, with the co-operation of the Boston Society of Natural History.

SCIENTIFIC NEWS IN WASHINGTON.

A New Building in the National Museum; more than Twelve Thousand Accessions made to the Museum since 1882, and nearly Seven and One-Half Million New Entries made in its Catalogues; Hundreds of Thousands of Interesting Specimens yet unpacked; Exhibits for which there is not even Storage-Room.—How the Cholera was spread in Japan in 1886.—The Proper Treatment of Inebriety as a Disease.—More about the Proposed Vacuum Air-Ship.

The Proposed New Building for the National Museum.

THE Senate Committee on the Library has reported favorably a bill to provide for the erection of an additional fire-proof building for the use of the National Museum. The appropriation made for this purpose is \$500,000, and the new building is to cover an area of 300 feet square, and to consist of two stories and basement. The site of the building is to be to the west of the Smithsonian Institution, flanking it on that side as the present building does upon the east. The present building contains about 80,000 square feet of floor-space available for exhibition and storage. The building proposed will contain about 220,000 square feet. The amount of room for offices and laboratories will be about the same in each. The net area in the new building available for exhibitions, storage, and office-rooms, as estimated, will be between five and six acres.

The cost of the present National Museum building was \$315,400, and that cost was less than that of any similar building in existence in this country. The proposed structure can now be erected at proportionately smaller cost, responsible builders having offered to build it for \$473,000. Plans of the interior and elevations of the proposed new building were submitted with the report of the committee.

To show the necessity of providing at once more extensive accommodations for the National Museum, the following interesting extracts from a letter written to the committee by Prof. S. P. Langley, secretary of the Smithsonian Institution, June 7, are given:—

"Since the erection of the present museum building there have been more than 12,000 accessions to the collections, chiefly by gifts. From the year 1859 to 1880 the accessions numbered 8,475. It is thus evident that within the last eight years the number of accessions has been half as large again as during the previous twenty-one.

"Many of the more recent accessions are of very great extent, as, for instance, the bequest of the late Isaac Lea of Philadelphia, which contains 20,000 specimens of shells, besides minerals and other objects; the Jeffries collection of fossil and recent shells of Europe, including 40,000 specimens; the Stearns collection of mollusks, numbering 100,000 specimens; the Riley collection of insects, containing 150,000 specimens; the Catlin collection of Indian paintings, about 500 in number; the collection of the American Institute of Mining Engineers, for the transportation of which to Washington several freight-cars were required.

"There are also the extensive collections obtained at the Fisheries Exhibitions at Berlin and London and at the close of the New Orleans Cotton Centennial; the Shepard collection of meteorites; the Wilson collection of archæological objects (more than 12,000 specimens); the Lorillard collection of Central American antiquities; and very many others nearly as extensive. In addition to these are the annual accretions from the work of the United States Fish Commission, the United States Geological Survey, and the Bureau of Ethnology, as well as the contributions from several expeditions of the government, from army and navy officers, and from other government officials. These are very extensive, and are yearly increasing in bulk and value.

"In the Armory Building are stored many hundreds of boxes of valuable material which we have not room to unpack, and the great vaults under the Smithsonian building and many of the attic and tower rooms are similarly occupied.

"For several important departments of the museum no exhibition space whatever is available, and no portion of the collection can be publicly displayed. Indeed, the growth of many of the departments is in large measure prevented by the fact that we have no room for additional exhibition-cases, or even for storage. Many valuable collections elsewhere than in Washington are at the service of the museum, but we have no space for their reception.

"At the close of the last fiscal year (June 30, 1887) a very careful estimate showed that the collections were sixteen times as great in number of specimens as in the year 1882.

"The museum is growing, as it is fitting that the national museum of a great country should grow; and it is not only necessary to care for what is already here, but to provide for the reception and display of what is certain to be placed in our hands within the next few years.

"The present museum building is not more than large enough for the ethnological and technological material already available. The proposed new building will afford accommodation for the natural-history collections, which are at present very inadequately housed. For instance, the amount of space assigned to the collection of mammals is about 6,500 feet. At least double that amount of space will be needed to accommodate the material now on hand as soon as the taxidermists of the museum shall have been able to prepare it for exhibition, it being our desire to have mounted groups, similar to the buffalo family recently finished, in order to preserve for future generations representations of the large quadrupeds native to this continent, which are on the verge of extinction.

"The collection of birds, which, so far as North America is concerned, is the finest in the world, is very inadequately shown, and requires double the case-room now available.

"The collection of mollusks, which is one of the most complete in the world, and contains more than 450,000 specimens, is at present almost entirely unprovided for.

"The collection of insects, which, though smaller, is, so far as North America is concerned, equally perfect, is also practically without any exhibition space. And so I might continue.

"It should be borne in mind that under the roofs of the Smithsonian and new museum buildings are grouped together collections which in London, Paris, or any other of the European capitals, are provided for in a group of museums, for the accommodation of which a much larger number of equally commodious buildings is found needful."

Causes of the Cholera Epidemic in Japan in 1886.

The *Marine Hospital Abstract of Sanitary Reports* for last Saturday contains extracts from a Japanese official publication on the cholera in that country in 1886. It spread over the whole empire, there being 155,574 cases, among which 110,086 were fatal. There were only seventeen days in the whole year in which no cases were reported. The following paragraphs from this report are interesting, because they show, what has been so often shown before, the effect of bad sanitary conditions upon the spread of an epidemic:—

"As to the cause of its outbreak and propagation, accurate evidence is wanting; it is an undeniable fact, however, that it sprang and was propagated from the widely spread germs of the disease

which had lain dormant in Osaka the preceding year, there being no trace of a fresh introduction. Osaka, in the autumn of the preceding year, had been invaded by the disease from Nagasaki; but after some thirty days of prevalence the epidemic gradually declined with the approach of the colder season, though it did not then entirely disappear. One or two cases kept occurring continually over into the next year, until, on the 2d of January, there were five cases reported in the western and southern districts of the city and in the ku of Sakai. On the 3d, five more cases were reported in the three ku of the west, south, and north, and the ku of Sakai. From this time forward, the number of cases gradually increased until the approach of the warmer season, toward the end of April, when it had spread all over the city, where it raged up to the end of October. During the epidemic, there were ninety-nine days in which the daily number of cases reported was over one hundred, and four days when there were two hundred. Indeed, it was the most severe epidemic ever known in Osaka.

"The situation of Osaka is such that it undoubtedly favors the propagation of an epidemic; for the water of the Yodo River, being conducted through the city by canals in various directions, besides furnishing a convenient roadway for transportation and water traffic, also receives the contents of the drains of the city, while at the same time it supplies the city with drinking-water.

"The wells, keeping the same level with the canals, freely communicate with each other, and thus the drinking-water of the city is more or less mingled with the water of the drains. Such, then, being the situation of Osaka, when an epidemic appears, the same convenience for the transportation of goods furnishes an easy medium for the propagation of disease. It is not strange, then, that since the tenth year of Meiji (1877), whenever an epidemic prevails, the city has been a centre of the epidemic. Moreover, in the preceding year there was much rain after the spring, until finally, in June, the Yodo River overflowed its banks, inundating the streets and houses. Hence the city was rendered very filthy, in consequence of which the concealed germs found a favorable nidus, from which the disease appeared with the return of the warm weather, and finally ravaged the whole city. It is also to be borne in mind, that, as Osaka is the commercial centre of Japan, and has free communication in every direction, it is likely to become the cradle of epidemics, and therefore whatever has made its appearance in various other localities has had its origin directly or indirectly in Osaka."

Drunkenness as a Disease.

Dr. Godding, superintendent of the Government Insane-Asylum in Washington, has written a letter to one of the committees of Congress, in which, while showing that it would be unwise to confine inebriates with insane persons, he makes the following interesting remarks:—

"Inebriety as a disease is distinct from insanity. Inebriates resent being placed with the insane; nor are the insane, as a rule, proud of them as associates. Insane from the poison of drink, as they undoubtedly are while the liquor is in them, they now and then get committed to hospitals for the insane, and in their detention during convalescence they afford interesting though unprofitable psychological studies. Dissolute in habit, and idle in life, they are uncomfortable from the start. They are usually fault-finding and impatient at their detention, denouncing every body and every thing about them. When quiet and seemingly at ease in their lot, they are studying how to smuggle in whiskey, or effect an escape. In them moral honesty and generous impulses are sadly wanting, and a condition of settled discontent characterizes the enforced abstinence of their hospital life. What they need is occupation and prolonged treatment in an industrial home, where they can be kept at work at enforced labor under the supervision of a judicious physician. As a rule, confinement in idleness does them little or no good."

The Vacuum Air-Ship again.

The House Committee on Ventilation and Acoustics recommends the passage of the bill, referred to in *Science* recently, making an appropriation to build a vacuum air-ship. The conditions of the grant of seventy-five thousand dollars are, that a like sum shall already have been spent upon the construction of the air-ship, and that the secretary of the navy, after an investigation, with the aid

of a board of engineers, into the plan of the construction of the proposed air-ship, and into the principle upon which it is proposed practically to operate it, shall be satisfied that there is reason to believe the air-ship will prove a success in attaining the ends for which it was designed. The last payment is to be made after a successful trial trip has been made. Dr. A. de Bausset, the inventor of this vacuum air-ship, proposes to make it in the form of a tube, air-tight, and cone-shaped at the ends, of steel of sufficient strength to withstand the pressure of the circumambient air when a vacuum has been produced by pumping all the inside air out of the ship. He says of his plan, "Steel $\frac{1}{4}$ of an inch in thickness has been tested, and has been proven capable of sustaining a pressure double that of the atmosphere. A cylinder 46 yards in diameter, with a total length of 218 yards, if made of this steel, will weigh 260,680 pounds: the volume of air contained in it weighs 719,709 pounds, giving an ascensional force of 459,029 pounds if the vacuum were complete." He relies upon an electric motor and a compound exhaust-screw to propel and guide the vessel when afloat.

Mr. George W. Melville, chief of the Bureau of Steam-Engineering, of the Navy Department, has written to Dr. de Bausset as follows: "I have the honor to inform you that I have looked over many of your computations, and find them correct, and also that the principle and theory of your aeroplane are in the main correct; but I have not sufficient time to properly study the details of construction of the vessel, which would be necessary in order to pass judgment upon it."

ELECTRICAL SCIENCE.

Tests of the Tudor Accumulator.

PROFESSOR KOHLRAUSCH has carried out some experiments on the Tudor accumulator which are not uninteresting. The following is part of the data obtained:—

Weight of plates	29.3 lbs.
Surface of four positive plates	1.29 sq. ft.
Volume of acid	6 pts.
Specific gravity, charged	1.147
Normal charge rate	5 ampères
Normal discharge rate	6.5 "
Internal resistance, charged	.015 ohms
" " discharged	.02 "
Capacity per pound	1.6 ampère-hours

The two cells that were tested had been in continuous use from November, 1881, to December, 1887. During the tests they were charged and discharged thirty-four times, and between charge and discharge a period of fifteen hours was allowed to elapse. Six experiments showed a total capacity of 47 ampère-hours, an efficiency of 82.4 per cent for energy, with a drop of 12.6 per cent in electro-motive force. After this several tests of an abnormal character were made. The cells were charged, and then left alone for various periods of time. There was a loss of about 7 ampère-hours at first, but after this there was no further loss in a week. When charged with a current of 8 ampères, and discharged at 10 ampères, the total efficiency was 64.7 per cent. When discharged through a constant resistance, with a current beginning at 50 ampères, they gave 23.5 ampère-hours and 40.5 watt-hours; the current falling from 50 ampères at the start to 40 ampères at the close, and the electro-motive force from 1.8 volts to 1.3 volts. They were then recharged, and discharged with 90 ampères at the commencement and 62 ampères at the end. After this enormous strain, the cells, when recharged, gave their normal discharge just as at first.

Lastly, they were run down for four days, starting at 1 ampère, until the electro-motive force had fallen to 0.2 volts, and the specific gravity of the acid to 1.1. The cells were then recharged, and on discharge gave 46.8 ampère-hours, with a total efficiency of 80 per cent. The tests show a length of life of the cell, and a power of resisting abnormal discharge and discharge rates, that is in advance of anything yet recorded. The storage capacity is, however, low as compared with more recent cells. As, however, it is in length of life and the allowing of heavy discharge rate that the ordinary battery is mainly deficient, these experiments encourage us to believe that in a few more years storage-batteries will have reached the point where their application to traction in cities will be almost

universal, and where they will make the distribution of electricity for lighting on a large scale better able to compete in price with gas.

THE MAGNETIZATION OF WATCHES.—With the rapid introduction of dynamo-electric machines and electric motors, there has arisen an inconvenience that is not only felt by those who work in electric-lighting stations, but which is likely to affect the public generally. Steel is usually used in the quick-moving parts of watches; and when this, for any reason, gets in a strong magnetic field, it becomes magnetized, greatly changing the rate of the watch, and making it irregular. It is possible to demagnetize a watch that is affected in this way; but it is a troublesome process, and is not a permanent safeguard. To avoid this trouble, non-magnetic balances are being rapidly introduced; and, although those made at present are more costly than steel, yet they add but little to the total cost of the watch, and make it reliable under all conditions. Probably the first to make an alloy that would possess the properties of hardness and elasticity without being magnetic, was Paillard. He has described several alloys that may be used; and watches made with balance-wheels and hair springs of these alloys have stood the most severe tests, with success. The most important component in the alloys is palladium. The other components are copper and iron, for one of the alloys; viz.:—

Palladium.....	50	to 75	parts
Copper.....	20	" 30	"
Iron.....	5	" 20	"

Another alloy is, —

Palladium.....	65	to 75	parts
Copper.....	15	" 25	"
Nickel.....	1	" 5	"
Gold.....	1	" 2½	"
Platinum.....	½	" 2	"
Silver.....	2	" 10	"
Steel.....	1	" 5	"

These alloys, especially the latter, are almost free from magnetic properties. Balances that are to be compensated for temperature are either made of two segments of alloys of different compositions, having different rates of expansion; or the segments are one of alloy, the other of silver. Since attention has been called to Paillard's methods, quite a number of manufacturers in this country and England have experimented on the subject, and are now making non-magnetic watches; and it is probable that at an early day the majority of the watches sold will be made to resist the action of magnetic fields.

CONDUCTIVITY OF A VACUUM.—M. Foepl has experimented on the conductivity of a vacuum by an ingenious method. He made an induction-coil whose secondary circuit consisted of a glass tube 7 millimetres external diameter, 4.2 millimetres internal diameter. The ends of this coil were connected to a second coil so arranged as to form a galvanometer, within which was a magnet suspended by a cocoon-fibre. The glass tube forming the secondary circuit was coiled in two layers of 18 turns; the primary coil was 24 centimetres long, and was composed of twelve layers of seventy-two turns of wire. With a current of 22 amperes in the primary, making and breaking the circuit, M. Foepl could not discover any deflection of the needle when there was a vacuum in the secondary tube, even when the degree of rarefaction was changed through a somewhat wide range. He calculates from his experiments that the resistance of such vacuums as he used could not be less than 3×10^6 times that of pure copper. This experiment bears directly on the question as to whether a perfect vacuum would be a perfect conductor or a perfect insulator, since the effect of the electrodes used to introduce the current into vacuum tubes is avoided. While it has, to within a short time, been admitted that a tube in which there is a very perfect vacuum will not admit the passage of electricity, it has been held by some that the result is due to an enormous resistance at the surface of the electrodes, not in the vacuum itself. This experiment disproves this view; at least, for the degrees of rarefaction employed. The wonderful influence of light on electric discharges that is being now investigated by so many experimenters would possibly have influenced the results of M. Foepl's experiments, if they had been tried in the presence of some intense source of light.

WINDMILLS FOR ELECTRIC-LIGHTING.—Some time ago the possibilities of windmills for domestic electric-lighting were mentioned in this journal, and lately the experiment has been practically tried. Professor Blyth read before the Glasgow Philosophical Society a paper on the subject, in which he describes an experiment which he made last summer, — the lighting of a cottage in which he spent his vacation by a dynamo driven by a windmill, and charging a storage-battery. The windmill used was an old-fashioned type, with four arms at right angles to each other, each of them thirteen feet long. There was no especial regulating-device. The dynamo was belted directly to the fly-wheel of the mill, and charged twelve cells of storage-battery which supplied the incandescent lamps in the cottage. Professor Blyth had never used more than ten lamps at once, but he could have used more. With a good breeze, enough electricity could be stored in half a day to supply light for four evenings of three or four hours each. The lamps used were of 8-candle power. When charging, the current passed through a cut-out that would disconnect them from the dynamo when it ran below a certain speed: so the windmill could be allowed to run all the time, charging the battery when the wind happened to be strong enough. The current had been used to run a light turning-lathe, and Professor Blyth had begun to make a light carriage to be run by the stored electricity. The paper opens to us a field for ingenuity, comfort, and amusement in our homes. Windmills much superior to that described can be readily purchased, a small dynamo can be bought or built at little cost, and storage-batteries can be purchased or made. With them we could light our house economically; our light would be better, cooler, and healthier than gas or coal-oil lamps; while the current could be utilized for running fans, sewing-machines, etc. Indeed, to the average American, with some spare time and some small ingenuity, the amusement and instruction of such a plant would more than pay for its expense.

HEALTH MATTERS.

Cremation of Garbage.

THE important subject of garbage-cremation, and the recent advances made in this method of disposing of this waste material, are admirably summed up in the following extract from the *Sanitary News*:—

An indorsement of the method of disposing of kitchen waste, recently inaugurated in Chicago, was pronounced before the section on State medicine at the Cincinnati meeting of the American Medical Association, Tuesday, May 8, by Dr. J. Berrien Lindsley of Nashville, Tenn. Dr. Lindsley's paper was an exhaustive *résumé* of the present status of garbage-cremation. He gave two or three examples showing the great quantity and variety of polluting material occurring without pause in the limits of a city.

Baltimore, August, 1887, estimated by police census, had a population of 437,155. The amount of night-soil delivered at the dumps for the year ending Dec. 31, 1887, was 51,107 loads, or 10,221,400 gallons. Probably more than half the inhabitants use water-closets which carry off an equal amount.

The dead animals, etc., removed during the same year, were:—

Total number of dead animals.....	25,249
" " fowls.....	9,079
" " fish.....	23,574
" " cart-loads of dead fish, vegetable and other offal removed from various docks.....	1,067
" " pounds of decayed meat condemned.....	1,495
" " dozens of eggs condemned.....	607

Richmond, population 100,000. The report of contractor for removal of garbage or kitchen refuse, year 1887, shows total number of loads carried off 2,680, equal to 72,200 bushels.

Memphis, population 62,335. Number of loads of garbage removed in 1887 was 29,120.

These examples were selected at random. To keep the city clean is the principal work of municipal governments, and requires more expenditure of money than all other objects combined, excepting schools and police.

The city filth naturally falls into four main subdivisions, — street-sweepings, night-soil, dead animals, and garbage. The latter alone concerns us at present. The definition of garbage is refuse

animal and vegetable matter from the kitchen. Every household is a workshop for garbage. In the country and small towns many a family is poisoned by the careless accumulation of the same near the well or sleeping-apartment. In small towns it is mostly got rid of by feeding to swine and cows; in larger communities, by carting off and polluting harbors or rivers.

In the second report of the State Board of Health of Maine, 1887, the secretary, Dr. A. G. Young, says, "Of the several methods which have hitherto been in use (for removing garbage), it may be said that none of them are free from serious objections. If the garbage is carried any considerable distance into the country, its transportation is attended with considerable cost. If buried, it still often remains a nuisance by contaminating the air or polluting the water in the neighborhood. If utilized in part as food for swine or cows, there is sometimes inflicted upon the community which sends it forth a retributive penalty in the shape of an unwholesome milk and meat supply.

"In the case of a seaboard town, if it is sent seaward, the garbage may depart from the place of its origin never to return, but in large part it is strewn along other coasts.

"The great desideratum has seemed to be some method which would not require a costly transportation of the garbage, or necessitate the defilement of our seashores, but which would radically and ultimately destroy it near the place where it is produced.

"Within the last few years, a new method of disposing of garbage has been written about and talked about, and to a considerable extent put into operation and practically tested. It is the method of destroying or cremating garbage by means of furnaces specially constructed for that purpose. Where these garbage-furnaces have been put into use, there is pretty uniform consensus of testimony as to their success. When rightly built, they have done their work satisfactorily, and generally at considerably less expense than had hitherto been incurred in disposing of the garbage otherwise. But little or no cost is incurred for fuel to run the furnace, as the garbage is dried more or less before it is burned, and is made to consume itself. The cost of labor in attending the furnace is not great, and generally there are no unpleasant odors given off in the process of burning.

"This method has not been much used in this country, but in Europe, and particularly in England, it has been extensively employed. Dr. O. A. Horr, a member of this board, who has lately returned from Europe, made special inquiry in regard to garbage-cremation in England, and all he could learn convinced him that this system is a success in that country. The garbage-furnaces in many of their towns have been in operation many years, and, in conversation with the health-officer of the city of London, he learned that there are now forty-five of the English towns which make use of this garbage-destruction.

"In this country, so far as I know, the experiment of destroying garbage by means of a furnace constructed specially for that purpose was first tried on Governor's Island, New York harbor. A description of this garbage-cremator was given in the *Sanitary Engineer* of Aug. 13, 1885, by Lieutenant Reilly, at this time acting assistant quartermaster, U. S. A., at that post." This description is reproduced in the report above quoted.

In the twelfth volume of 'Public Health,' containing the reports and papers presented to the American Public Health Association, at the Toronto meeting, October, 1886, may be found a paper by Dr. George Baird of Wheeling, giving an account not only of the destruction of garbage, but also of night-soil, by means of a furnace contrived by M. V. Smith, M.E., Bissell's Block, Pittsburgh, Penn. Dr. Baird is brief, and has "only tried to furnish proof of its capacity to solve a long-tried problem in the government of our cities and large towns."

The city authorities of Wheeling were stimulated to action by those of Bellaire, O., on the opposite side of the river, but in close proximity. The dumping of night-soil and garbage from Wheeling into the Ohio River had become an intolerable nuisance to the inhabitants of Bellaire living just below. No alternative remained but to abate the nuisance. A similar alternative will soon be forced upon many of our riparian cities and towns. Law will decide that rivers do not belong to those who happen to dwell near the source, but equally to all below, and that the upper few have

no right to deposit their filth in floating columns upon the lower many.

In the 'Report on the Sanitary State of Montreal for the Year 1886,' will be found an interesting narrative in this connection, giving instructive details as to cost, showing the extent of the work to be done and the complete success of the refuse-crematories, and also of the night-soil crematories. It thus appears that Wheeling and Montreal are the pioneer cities in arousing public attention to the cremation of garbage and night-soil.

Dr. Lindsley then sketches the later developments in the new method of destruction and sanitation by fire.

"Other cities," he says, "are taking hold of the experiment with much enthusiasm. *The Sanitary News* of Nov. 19, 1887, states that at Des Moines, Io., a small Engle furnace is in experimental use, and is working very satisfactorily. At Pittsburgh a Rider furnace had just commenced its service. In Chicago a Mann furnace was being constructed.

"In the same valuable journal, March 17, 1888, may be found a full description of the Chicago garbage-crematory, from which a duplicate of the plant could be built if desired.

"On April 14 it reports that the said crematory is doing good service in disposing of about fifty tons of material a day. *The Sanitary News* of March 10, 1888, reports the success of the disposal of garbage by cremation at Milwaukee.

"All who are concerned in this important subject will look forward with great interest to a paper on cremation, to be read at the Milwaukee meeting of the American Public Health Association in November next by Oscar C. De Wolf, M.D., the eminent health-commissioner of Chicago.

"We have seen how very recent is the resort to cremation for getting rid of garbage and other refuse in America, and it may with truth be claimed that Mr. J. M. Keating of Memphis, familiar with epidemics, first set this ball in motion. At the Indianapolis meeting of the American Public Health Association, October, 1882, he presented a paper on 'The Cremation of Excreta and Household Refuse.' He closes the paper thus: 'There is no real safety save by cremation. Yankee ingenuity, once directed in this channel, will doubtless be equal to the emergency, and provide just the kind of cheap furnace or stove necessary for the purpose. By this means, and this alone, can the ultimate of sanitation be realized.'

"Already, in 1879, Mr. Keating had presented his views on this subject through the *New York Herald*, and with the indorsement of that influential paper. In the American Public Health Association, however, he had a deeply interested auditory of experts, and his views attracted much attention. He was induced by many of its active members to prepare an elaborate paper for its meeting at St. Louis, October, 1884, which was published under the title, 'The Ultimate of Sanitation by Fire.' This is probably the most complete and thorough monograph on the subject in the English language. It was widely circulated in the volumes of the American Public Health Association and other channels.

"Individually, I subscribe to the principles and practical conclusions maintained and explained by Mr. Keating, and feel quite confident that in a few years Yankee ingenuity will provide in great perfection the apparatus necessary for daily and cheap use.

"On this occasion I have confined myself to the cremation of garbage, because I am convinced that it will speedily come into use throughout America with like rapidity as has electric-lighting, and will pave the way for a wider and more perfect application of sanitation by fire."

Milk.

Dr. Parkes writes to the *British Medical Journal* as follows: "Whilst not denying that the tubercular virus may find other means of reaching the digestive tract than through unboiled cow's milk, it appears to me that there are no sufficient safeguards in the management of town dairies to warrant us in assuming that milk from cows in an advanced stage of tuberculosis has no chance of being mixed with the milk of other healthy cows. In every dairy of any size there will probably be tubercular cows, some of them, perhaps, with tubercular deposits in the udders; and, as it is the common custom with dairymen to mix together the milk yielded by different cows, it is not too much to assume that tubercle bacilli

may be widely distributed in the milk-supply of any town. It has been said that the tuberculosis of cattle is not the same disease as the tuberculosis of man, and that the absence of any proof of the human variety having ever been dependent upon ingestion or inoculation of the virus of the bovine variety tends to strengthen such a belief. To this it may be replied, that the bacilli of bovine tuberculosis are identical — according to all bacteriological methods at present known — with those found in tubercular formations in the organs of man, and that, although the disease presents anatomical differences in man and cattle, these differences may be explained as being due to differences of soil in the human and bovine tissues, the bacilli ingrafting themselves in those tissues which present conditions most favorable to their growth and development; second, absence of proof may only mean want of observation or recorded data, and cannot be held to imply that at no future time will satisfactory evidence of the dependence of the human disease upon a bovine source be brought to light.

"Having regard to all those considerations, surely the time has arrived when a radical change in the present methods of milk-production and milk-consumption is urgently needed. In the first place, it should be rendered illegal for cows known to be suffering from tuberculosis to be kept in stock by dairymen and farmers for milking purposes; and, second, in no household should unboiled milk be consumed, more especially by children. No other animal food is consumed by civilized nations in an uncooked state; and by the light of our recently acquired knowledge it would appear that there is as much, or more, danger connected with the practice of drinking unboiled milk as of eating raw flesh.

"Exposure to the heat of boiling water for five minutes destroys the life and action of the tubercular virus (Klein); and the same is true of the other specific disease-poisons. By such simple means, then, is it possible to guard against an ever-present source of danger, as well as to obtain protection from those possibilities of the introduction into our bodies of the viruses of enteric-fever, scarlet-fever, and the like, which the experience of past epidemics has taught us to be latent possibilities in milk, with powers of development at the most unexpected periods. If medical practitioners generally recognized the importance of these views, and were careful to enforce them upon those intrusted with the care of delicate children of scrofulous diathesis, or with hereditary tendencies to tubercle, a commencement would be made in the right direction, which would gradually extend itself through all classes of society."

ACTION OF BOILING WATER ON TYPHOID BACILLI. — Wilchur of St. Petersburg has found that when a volume of boiling water equal to that of a gelatine culture of typhoid bacilli is used on the culture, the bacilli are only partly destroyed; and that when the volume of water is double that of the culture, all the bacilli are killed. Experiments on the dejecta of typhoid patients showed that when four times the volume of water was added to the dejecta, the bacilli were invariably destroyed.

DEATHS FROM POISON. — There were in Great Britain, in 1886, 511 deaths from poison, including cases of chronic poisoning by lead. Of these, 327 were accidental, 178 suicidal, and only 6 homicidal. Lead heads the list of agents giving rise to accidental poisoning (95 cases); then follow opium and its derivatives (82 cases); carbolic acid (20 cases); belladonna is responsible for 9 cases; alcohol for 7; aconite, chlorodyne, and hydrochloric acid, each for 6; prussic acid, ammonia, and strychnine, each for 5. Carbolic acid was selected by 42 suicides; opium, laudanum, or morphine, by 41; oxalic acid, by 28; prussic acid, by 25; vermin-killer, by 18; hydrochloric acid, by 15; strychnine, by 14; sulphuric acid and arsenic have lost their popularity, the former having been used only by six and the latter by five persons.

DEATH IN BLIZZARDS DUE TO ASPHYXIA. — Markham writes to the *Journal of the American Medical Association* of Feb. 18, 1888, stating that there is an amount of evidence and a combination of circumstances sufficient to show that the greater number of the several hundreds who lost their lives in the recent great blizzard of the North-west perished from asphyxia, and not by freezing. Many of the bodies, when found, were in the position of grasping or clutching at their necks or throats. Indoor witnesses

describe the atmosphere as having an appearance of density and darkness, similar to that stated by divers as existing when submerged with their armor in deep water. Many that escaped describe their peril as being from loss of breath or suffocation.

CROTON WATER. — At a recent meeting of the Medical Society of the County of New York, Dr. John C. Peters read a paper on 'The Water-Supply from the Croton Lake System,' in which he stated that the sewage created by 25,000 people, the largest condensed-milk factory in the world, 10,000 cows, 1,200 horses, 1,500 hogs, and 40 factories, was all being run into that body of water from which the city of New York draws its water-supply. While in former years the Thames water used by London contained five times as much bacteria as Croton water, recent investigations showed that in one cubic centimetre New York water contained 526 bacteria, against 44 contained by London water. While, of course, the greater part of these were the common, harmless bacteria, still there was a large proportion capable of producing disease; and he expressed the opinion that a great deal of the scarlet-fever, diphtheria, and other infectious diseases which prevailed in New York, might be traceable to germs derived from the water-supply.

HAIR-WASHES. — We learn from the *American Analyst* that recent analyses have shown, that of the preparations for bleaching the hair to "the delicate golden shade so much admired by the court circles of Europe, and the best society of the United States," to quote from a label on one of the bottles, all depend for their action upon the decolorizing and corrosive influence of nascent oxygen or nascent chlorine. The bases used in the various nostrums for this purpose are peroxide of hydrogen, aqua regia, and bronzer's acid. Peroxide of hydrogen is the mildest and most innocuous of the trio named. It is a colorless liquid which destroys the natural color of the hair, and which, if used long enough, turns it an unnatural grayish-white. It is rather expensive, and is therefore used much less than the two other acids. It produces sores upon the scalp, and gives rise to skin-complaints that resemble tetter, salt-rheum, and scald-head. The two acids are equally vile. They attack and eat the hair and skin alike. The former they partly bleach, and partly burn to a handsome gold color; the latter they stain to about the same hue as does a light application of iodine. Besides the dermatologic troubles named, they cause maladies hardly distinguishable from eczema and erythema. One curious disease that they cause is an inflammation of the cells of the hair follicles. The cellular walls break down, and lymph, and often blood, is extravasated in appreciable quantities. All three bases produce falling-out of the hair and premature baldness.

BOOK-REVIEWS.

The Social Influence of Christianity. By DAVID J. HILL. Boston, Silver, Burdett, & Co. 12°. \$1.25.

THIS volume consists of a series of lectures delivered at the Newton Theological Institution, and designed partly to show what Christianity has done for society in the past, but more particularly to indicate its attitude toward the problems of the present. The treatment of such themes in lectures is attended with serious drawbacks, as it tempts the speaker to be what is called eloquent rather than thoughtful or clear; and this tendency is plainly visible in Dr. Hill's work.

The second chapter, on what Christianity has done for society, is a perfect dithyramb; and though it may have been well liked where it was originally delivered, yet when read in a quiet hour its turgid style and exaggerated statements produce an effect quite different from what the author intended. He seems to think that the higher civilization, which is well known to be of Greek origin, is really the product of Christianity. This part of his work, indeed, is vitiated throughout by the fallacy known to logicians as *post hoc, ergo propter hoc*, a very serious fault in the treatment of social questions.

In considering the social and political problems of the present day, Dr. Hill takes the same ground that other Christian teachers do, and we cannot see that he advances any thing new. In regard to the distribution of wealth, he admits that Christianity has no means of solving the problem; and the only suggestion he has to

make is that employers should treat their workmen well, and give freely in charity. It would have been far better to take the ground that the distribution of wealth is not a religious question, and that religious teachers, as such, have nothing to do with it. On the subjects of marriage and family life, and on the duties of parents to their children, the author has many good remarks; and here, as well as in the chapters on wealth, he shows himself unalterably opposed to the communistic doctrines now so widely prevalent. The chapter on 'Christianity and the Problems of Education' contains an earnest and in some respects able plea for moral and religious teaching in both public and private schools.

Dr. Hill's book seems to us the work of an earnest Christian man, deeply interested in the social problems of the time, but unfortunately lacking in the analytical and critical power which the thorough treatment of those problems requires.

NOTES AND NEWS.

THE long-neglected graphic study of the Mexican tribes has within the last twenty years received a new impulse by several native and foreign scientists who published their results through their own publishers. The governments of the single States are also becoming aware of the fact that something should be done for researches on the tribes within their borders. Thus, General Mariano Jimenez, governor of Michoacan, is providing now for the publication, at public expense, of the *Anales del Museo Michoacano* at Morelia, the capital, having previously shown his love for science by founding the new Museo Michoacano, and providing for its maintenance. The editorship of the *Anales* is in the hands of the director of the museum, Dr. Nicolas Leon, well known already through his republication of ancient books on Indians and their languages. The first three numbers (all published in 1888) which have come to hand contain thirty-two pages each, and the following treatises: 'Arithmetic among the Tarascos (Tarascan Numerals);' 'Etymology of Tarascan Geographical Names;' 'The Tarascan Grammar of Father Lagunas (in the Original Text);' 'On the National Name "Tarasco";' 'The Tarascan Calendar (after a Manuscript in the Congressional Library, Washington);' 'Codex Plancarte, on Tarascan Antiquities of the Fifteenth and Sixteenth Centuries.' The *Anales* may be ordered through George A. Leavitt & Co., 787-789 Broadway, New York City.

— A book of a singular value for ethnography is Lieut. H. T. Allen's 'Report of an Expedition to the Copper, Tananá, and Kóykuk Rivers in Alaska, 1885,' an octavo government publication of one hundred and seventy-two pages, and many maps and illustrations from photographs. The exploring force consisted of three men, and had to proceed up the Copper River, and descend the Tanana River valley. Its explorations covered a space of approximately two hundred and forty thousand square miles and seventeen degrees of latitude, the area of which was almost entirely unknown up to the present time. The narrative of the exploring party is of picturesque and varied interest, and in every way is highly instructive for future travellers through these lonesome tracts. The observations made on the characters of the savages show that the former often partake of the burlesque. Among the tribes met with, we mention the Midnooskies, Mahlemuts, Atnatánas, Tananatánas, Ingaliiks or Kaiyu-Khotánas, Unakho-tánas, Mnakho-tánas, Nabesna-tánas, etc. The tribes ending in *-tána* ('men') are all of the Tinné stock, while those in *-miut* are Innuít or Eskimo. The appendix contains zoölogical, geological, mineralogical, and meteorological observations of value.

— *Nature* attributes to the Vienna correspondent of the *Times* the announcement, that, in pursuance of a resolution passed at a recent meeting, the Vienna geologists will invite the International Geologists' Congress, which will assemble in London in September, to hold its next meeting in Vienna.

— At a recent meeting of the Victoria Royal Society, according to *Nature*, the president (Professor Kerrot) announced that the first meeting of the Australian Association for the Advancement of Science would be held at Sydney, beginning Sept. 4, the second at Melbourne, the third at Adelaide. The proposal that Victoria

should join in the movement was favorably received, but at that meeting no action was taken in the matter.

— The Statistical Abstract for 1887, just issued, gives the following interesting figures in regard to the schools of the United States. In 1871-72 there were in this country 12,828,847 children of school-age, of whom 7,479,656 were enrolled in the public schools. These pupils were taught by 81,509 male, and 124,180 female teachers, to whom aggregate salaries of \$37,503,309 were paid. The total expenditure for the schools that year was \$70,891,374. In 1884-85 the school population had increased to 17,764,658, and the number of pupils enrolled in the public schools to 11,464,661. The number of male teachers was 109,632, and of female 199,422, to whom salaries amounting to \$73,932,668 were paid. The total expenditures upon the schools for the latter year were \$111,521,542.

— A very successful meeting of the Massachusetts Assembly of the Agassiz Association was held at Boston, May 29, 30, and 31. The sessions were held in the lecture-room of the Boston Society of Natural History, by the courteous invitation of that organization; and there, after a preliminary meeting of the delegates at the Parker House, the convention assembled at 8 o'clock Tuesday evening for a business meeting. The business consisted almost entirely in the election of officers, and, with scarcely an exception, the old board were re-elected. At 9 o'clock Wednesday morning President Farrar, of the assembly, opened the exercises by an address of welcome, to which the president of the Agassiz Association responded. Reports of work were next given by delegates from the twenty-one chapters represented, and from the Boston Assembly. These reports were of the most interesting character, and showed not only the deepest earnestness on the part of the chapters, but also gave evidence of much faithful work already accomplished by them. The convention was next addressed by Prof. Edward S. Morse, director of the Peabody Academy of Science at Salem, Mass. Professor Morse stated forcibly the advantages of a thorough scientific training, and cordially commended the association for the good work it has accomplished, pointing out various lines in which it may hereafter work to increased advantage. Prof. Alpheus Hyatt, curator of the Boston Society of Natural History, followed in a most helpful address, in which, after heartily seconding Professor Morse's suggestions, he emphasized still more strongly the possibilities of usefulness that are in the association, and showed the great desirability of securing as soon as possible such an endowment as may place the work of the Agassiz Association upon a permanent basis. He then gave a clear account of the Agassiz Museum, which the delegates were soon to visit, explaining the principles which rule in the arrangement of its contents, and illustrating by diagrams and carefully selected specimens, the distribution of the collections in the different rooms. Dr. Lincoln closed the morning by an exceedingly instructive and interesting address on the minerals of Boston and vicinity. In the afternoon and evening, parties of delegates, under the guidance of committees from the Boston chapters, visited various places of interest. About one hundred were present during the convention, many pleasant acquaintances were formed, and all felt that a long step had been taken toward advancing the assembly toward that position of stability to which it aspires. Perfect harmony prevailed, and the delegates separated with the firm determination to work for the association more diligently than ever; and this determination was expressed not carelessly, but with actual enthusiasm. In addition to those mentioned above, Prof. W. O. Crosby gave a most suggestive and helpful address.

— The fifth annual convention of the Association of Official Agricultural Chemists will be held at the United States Department of Agriculture on Thursday, Friday, and Saturday, Aug. 9, 10, and 11. All who are interested in the analysis of fertilizers, cattle-foods, dairy products, alcoholic beverages, and sugar are invited to attend.

— The State Board of Health of Michigan has just published its fourteenth annual report, for the fiscal year ending September, 1886. It contains very many valuable papers, to most of which we have already referred in *Science*. Among the most important are

the following: 'Tyrotoxin, its Presence in Poisonous Ice-Cream,' by Victor C. Vaughan, M.D., Ph.D.; 'Analysis of Five Hundred Deaths occurring in the Michigan Mutual Life Insurance Company,' by Henry F. Lyster, M.D.; 'Causation of Pneumonia,' by Henry B. Baker, M.D., with illustrations, diagrams, etc.; and 'Communicable Diseases in Michigan during the Year ending Dec. 31, 1886.'

—The cod and whale fisheries in the north of Norway, according to *Nature*, have entirely failed this spring, and it is suggested that the non-appearance of the former is due to the low temperature of the sea this season. Thus the Russian naval officers stationed on the Murman coast found in May only a surface temperature of from 1° to 2° C., and along the Norwegian coast it has been lower still. As to the whale-fishing, only 40 animals had been captured by the end of April, against 200 last year. It is maintained that the present wholesale slaughter carried out by Norwegian and Russian steamers equipped with harpoon guns will eventually extirpate these animals, and some measure for their preservation is contemplated. Advices from the Arctic regions state that there was an enormous mass of drift-ice in those waters during this spring. Two sealers, the 'Hekla' and the famous 'Vega,' were imprisoned for more than a month in the ice to the north-east of Norway.

—We learn from *Nature* that the annual meeting for the election of fellows of the Royal Society was held at the society's rooms in Burlington House on June 7, when the following gentlemen were elected: Thomas Andrews, F.R.S.E.; James Thomson Bottomley, M.A.; Charles Vernon Boys; Arthur Herbert Church, M.A.; Prof. Alfred George Greenhill, M.A.; Lieut.-Gen. Sir William F. D. Jervois, R.E.; Prof. Charles Lapworth, LL.D.; Prof. T. Jeffery Parker; Prof. John Henry Poynting, M.A.; Prof. William Ramsay, Ph.D.; Thomas Pridgin Teale, F.R.C.S.; William Topley, F.G.S.; Henry Trimen, M.B.; Prof. Henry Marshall Ward, M.A.; William Henry White, M.I.C.E.

—The laying of the corner-stone of the new building of the Pennsylvania Agricultural Experiment Station took place Wednesday, June 27, at State College, Penn.

—The New York Mineralogical Club has arranged for excursions on the Saturday afternoons of the present season. It is intended that these outings shall acquaint the members personally with the most interesting localities of the neighborhood; enable them to secure specimens suitable for the permanent cabinet of the club, as well as for private possession; and enlarge the influence of the club by associating with its regular members, in these informal trips, any persons of suitable standing (ladies or gentlemen) who may feel an interest therein.

—The thirty-seventh meeting of the American Association for the Advancement of Science will be held at Cleveland, Aug. 15–21. The date of Aug. 22 was determined upon; but owing to the national gathering of the Knights Templars in Cleveland during that week, and at the earnest solicitations of the local committee, the council have changed the date to Aug. 15. A large local committee has been organized, the several sub-committees of which are working earnestly, and, so far as depends upon the committee, a successful meeting is assured. A special office and reception-rooms for the association have been opened at No. 407 Superior Street, next door to the Hollenden, where will be the hotel headquarters. The meetings will be held in the Central High School building on Wilson Avenue, where also will be the offices of the local committee and of the permanent secretary during the week of the meeting. A special circular in relation to railroads, hotels, and other matters, will be issued by the local committee. The members of Section E will hold an informal meeting at the Central High School building on Tuesday, Aug. 14, at 3 o'clock, to consider plans for holding sessions between the annual meetings of the association. The Entomological Club will meet at 9 A.M., on Wednesday, Aug. 15, at the Central High School building. The Botanical Club will hold a meeting, as usual, on the day preceding the meeting of the association, in the Central High School building. The Society for the Promotion of Agricultural Science will hold its ninth annual meeting in Cleveland, beginning on Monday evening, Aug. 13, at the Central High School building, and continuing on Tuesday.

—During the summer of 1887, the manager of the physical and chemical department of James W. Queen & Co., Mr. Joseph J. Walton, made a three-months' tour in Europe for the purpose of perfecting arrangements for the sale of new forms of apparatus in this country, and also to look up any thing new and interesting which would be of value to those interested in these and other branches of science. One of the first places visited was the laboratory of Sir William Thomson, at the University in Glasgow. Mr. Walton also had the pleasure of examining the newly equipped laboratory of Professor Ayrton at the City and London Guilds Institute, and the Cambridge Scientific Instrument Company stock of physiological apparatus. Another valuable result of the stay in England was the arrangement which has been made for the furnishing of practical and cheap apparatus for the use of students in the study of physics by the new method,—that of allowing the student to experiment for himself. A visit was paid to the works of Siemens Brothers & Co. In Paris special attention was paid to the physiological apparatus of Verdin. Special attention was paid, both in Paris and Berlin, to the subject of apparatus for the study of bacteriology. At the well-known house of Duboscq, in Paris, a number of new optical instruments were examined and purchased. Quite a visit was paid to the ateliers of the Société Genevoise pour la Construction d'Instruments de Physique at Geneva. The optical establishments in Munich were among the places visited. Steinheil, Merz, and others have long been known as the best makers of prisms, lenses, etc., in Europe. Some new forms of balances were found by Mr. Walton. One has a very ingenious new arrangement for varying the sensibility. We may add there are other instruments of which we have not spoken, for which the firm soon hope to have price-lists ready and to put on the market. Some of these may prove of even greater value than many of those mentioned.

—*Engineering* gives an account of a new material bearing the name of 'woodite,' which is being introduced as a protection to ships of war, and for many other purposes. Woodite is a substance bearing a strong resemblance to native india-rubber, but, unlike that material, it never grows sticky, and resists the action of oils and heat. If it be placed on the outside of a vessel, a shot may be driven through it, and yet it will close up so completely that it is difficult to find the speck which marks the spot where the shot entered. Woodite is coming into use for many commercial purposes, such as delivery-valves, air-pump valves, packing, wheel-tires, and it is said to be far more efficient for these purposes than either leather or india-rubber.

—The French General Transatlantic Company has furnished its large fleet with complete apparatus for dropping oil on the waves during bad weather. The company states that it has adopted the use of oil after repeated trials.

—Ginn & Co. will publish in July 'A College Algebra' prepared by Professor Wentworth. —William S. Gottsberger publishes a volume of five tales of ancient Greece entitled 'Pictures from Hellas,' by Peder Mariager, translated from the Danish by Mary J. Safford. —D. C. Heath & Co. will publish at once Volume II. of Dr. Bernhardt's 'Novellen Bibliothek.' —The Worthington Company will publish at once a book entitled 'William Shakespeare portrayed by Himself: a Revelation of the Poet in the Career and Character of One of his Dramatic Heroes,' by Robert Waters. —Waterman & Amee, Cambridge, Mass., have in press a volume of 'Selections illustrating Economic History since the Seven-Years' War,' by Benjamin Rand. —Prof. Richard T. Ely's treatise on 'Taxation in American States and Cities,' recently published by T. Y. Crowell & Co., is to be used as a textbook in the Buffalo Law School and at Vanderbilt University. —The Historical Publishing Company, 61 Broadway, New York, will publish at once a volume entitled 'Camp-Fire Stories,' by W. F. Cody ('Buffalo Bill'). It is not altogether about his own frontier experiences that Mr. Cody has written, but of those of Daniel Boone, Kit Carson, and other pathfinders. The manuscript, which makes seven hundred printed pages, was dictated to a stenographer during 'Buffalo Bill's' English trip. —'Methods and Aids in teaching Geography,' is the title of a new educational work by Charles F. King, A.M., head master of the Dearborn School in

Boston, to be published by Messrs. Lee & Shepard. The same firm has now in press a new volume of travels entitled 'Mexico, Picturesque, Political, Progressive,' the joint work of Mrs. Mary Elizabeth Blake of Boston, and Mrs. Margaret F. Sullivan of Chicago. — Dr. Allan McLane Hamilton will contribute a paper in the July issue of *The American Magazine* on 'Spiritualism and Like Delusions,' in which he will show that spiritualism is at best a form of mild insanity. — The *Popular Science Monthly* for July contains the following articles: 'Safety in House-Drainage,' by William E. Hoyt; 'Gourds and Bottles,' by Grant Allen; 'Darwinism and the Christian Faith,' 'The Teaching of Psychology,' by M. Paul Janet; 'Customs and Arts of the Kwakwaka'wakw,' by George M. Dawson; 'Lines of Progress in Agriculture,' by Dr. Manly Miles; 'Fallacies in the Trades-Unions Argument,' by J. B. Mann; 'Botany as it may be Taught,' by Prof. Byron D. Halsted; 'Arctic Alaska,' by W. L. Howard; 'Manual or Industrial Training,' by Prof. G. Von Taube; and a sketch of Paul Bert. — *Time*, under which title *Tid-Bits* will hereafter be known, as being more nearly answerable to the present character of the paper, will be conducted on the same lines which have won *Tid-Bits* its success; the changes made with the present issue being external only, and not affecting the methods of the paper, which remains under the same proprietorship and editorial management.

— The *Engineering and Mining Journal* is authority for the statement that the 'record' in rapid machine-work has again been lowered. Heretofore the Baldwin Locomotive Works of Philadelphia have held the first place with the record of an engine built in twenty-four hours, but the Pennsylvania Railroad Company has now taken the palm by constructing a full-sized (110,000 pounds) anthracite-burning locomotive at the Altoona shops in sixteen hours fifty-five minutes. The work was commenced on the morning of the 18th of June, and in five minutes less than seventeen hours the engine was turned out ready for use. It is to run on the New York division of the Pennsylvania Railroad. This feat is, we believe, quite unrivalled in locomotive-building.

— Prof. Simon Newcomb, superintendent of the Nautical Almanac Office, is seriously ill of spinal irritability, and, on the recommendation of a board of medical officers, has gone to the Chelsea Hospital for special treatment.

— Dr. W. J. Hoffman of the Bureau of Ethnology has gone to northern Minnesota to obtain some important historical information which has been promised him by influential Indian chiefs who live near the Canada line.

— Mr. Arthur P. Davis of the Geological Survey Office, and Miss Lizzie Brown of the Nautical Almanac Office, were married on the evening of the 21st inst. Mr. Davis is a nephew of Major J. W. Powell, director of the Geological Survey, and Miss Brown is one of the most accomplished mathematicians in the country. Each had been a member of the Corcoran Scientific School of the Columbian University, and each had just received its degree of Bachelor of Science.

— The Signal Office has been making experiments in the courtyard of the War Department building with a new machine for testing anemometers. The device consists of several arms, each twenty-eight feet long, on the ends of which are placed anemometer-cups such as are used in the Signal Service. The arms being revolved at a given rate of speed, the rate recorded by the anemometer-cups is compared with the known rate, and any differences noted. Professor Hazen, who has had charge of the experiments, says that they have been satisfactory, although absolutely still air has not been obtained in the War Department courtyard. Even when there was a dead calm outside, a very perceptible movement of the air inside the court-yard was observed. This phenomenon, which occurred early in the morning, was attributed to the fact that the court-yard had become greatly heated the day before, and the warm air was then rising and being forced out by the cooler, denser atmosphere from the outside, that came into the court-yard through the two carriage-ways. Similar experiments to discover the exact relation between the movement of the wind and the whirling of the cups were made about 1850, but in the machine

used then the arm was only four feet long, instead of twenty-eight as in the new one. When the short arms were whirled with great velocity, they caused a very perceptible movement of the air.

— The magnificent water-front of Staten Island is so important a part of New York harbor, and access to it from the mainland is so easy, that more or less definite projects for reaching it by railroad have been often brought forward. The Arthur Kill Bridge, which is now practically completed, will, if it is allowed to stand, enable the lines now entering Jersey City to reach directly the deep water on the Staten Island front, and will greatly increase the available capacity of the harbor for handling freight.

— In *Bradstreet's* of June 23 is given the message of Dr. Miguel Juarez Colman to the National Congress of the Argentine Republic. In this message are presented important facts in regard to the progress of this South American Republic. Argentine Republic has an area of 1,125,086 square miles, with a population in 1887 of 3,935,286. It has made wonderful progress in the building of railways. Of the 17 railways conceded, 13 have the guaranty of the government. The guaranteed lines report a length of 7,961 kilometres, and the unguaranteed 1,272, making 9,233 kilometres. The contracts for the following guaranteed lines are already prepared: Tartagal Reconquista to Formosa, Bahia Blanca to Ville Mercedes, San Juan to Salta, Chumbreha to Tinogosta and Andalugata, Goya to Monte Caseros, Resistencia to Metan, and San Custobal to Tucuman. The aggregate length of railways in operation is 6,306 kilometres, equal to 3,918 $\frac{4}{10}$ miles. These roads have carried within a year 7,657,406 passengers and 3,705,876 tons of freight. The gross revenue from the yearly traffic is \$23,805,722.15, against expenses of \$13,177,172.15, giving a net annual revenue of \$10,627,950.14. The debt of the Republic March 31, 1888, was: internal, \$47,100,000; and external, \$92,427,000. The latter is expected to be paid off within eight years. Argentine 5-per-cents issued in 1887 at 85 $\frac{1}{2}$ were on March 31 quoted at 97, and the 6-per-cents at 102 @ 104 $\frac{1}{2}$. In 1886 the import and export trade aggregated \$194,000,000. In 1887 it had increased \$24,000,000, of which \$9,500,000 were imports, and \$14,500,000 exports. The gain is due to the increased production of cereals, hides, and frozen meats. The suppression of export duties has also contributed to the increase in the volume of exports. Import and export values in the first quarter of 1888 show an increase, when compared with the first quarter in 1887, of \$4,000,000. In 1884 the total revenue was \$46,762,000. The revenue for 1887 was early estimated at \$50,522,000, but it produced \$58,135,000, or \$13,372,000 in excess of the revenue of 1886. The budget of expenses in 1887 was \$43,263,000, and \$6,756,000 for special laws without special resources, leaving a remainder of \$8,116,000. In the fourteen provinces of the Republic are 2,080 schools, with 142,471 pupils. There are 116 schools in the capital of the Republic, including 24 graduated, 56 elementary, 20 for infants, and 16 for adults. In the 116 schools are 746 teachers, including 224 male and 522 female. In the national territories there are at the present time 42 schools, with 64 teachers and 2,998 scholars. The total immigration in 1887 was 137,000, and for the first quarter of 1888, 40,500. The expected immigration in all of 1888 is about 200,000. The cost of passage from Europe for 50,000 agriculturists and artisans will be advanced to enable them to come to Argentine Republic in 1888. The commissary of immigration has gone to Europe to establish the requisite appliances to promote immigration. Immigration, colonization, and railways are rapidly transforming the country, and as a consequence its productive forces are being multiplied, and the comforts of life there are increased. The field of labor is enlarged, the educational work is taking rapid strides, and internal improvements are receiving attention from the government.

— The courses in physics which were proposed for this summer at Harvard College have been given up because of the small number of applications for them received up to June 1, which was the date mentioned in the physics circular. On Saturday, July 7, and on Saturday, July 14, an exposition of the apparatus and methods which would have been used in the elementary summer course will be given at the Jefferson Physical Laboratory, Cambridge, the hours each day being from 10 to 1 and from 3 to 5. This exposi-

tion will be for the benefit particularly of those who propose to teach the elementary physics of the requirements for admission to Harvard College. Admission will be free.

— We learn from *Nature* that the conferences convened by the London Chamber of Commerce to consider the question of commercial education led to the appointment of a committee for the full discussion of the subject. This committee nominated a sub-committee, among the members of which were Sir John Lubbock, Sir Henry Roscoe, and Sir B. Samuelson. A scheme for the improvement of commercial education has now been drawn up by the sub-committee, and sent to various business-men, schoolmasters, and other authorities on education, with a request for practical suggestions. The scheme, as it stands, proposes as obligatory subjects for examination for a commercial certificate, (1) English; (2) Latin; (3a) French; (3b) German, Spanish, or Italian; (4) history of British Isles and colonies, general and modern history, including commercial history; (5) geography, physical, political, commercial, and industrial; (6) mathematics; (7) drawing. Proficiency is also required in at least one of the following: physics, chemistry, natural history, commerce, and political economy.

LETTERS TO THE EDITOR.

. Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

The Ancient Works of Ohio.

As investigation and explorations proceed, one ray of light after another pierces the mystery which has so long hovered about the ancient works of Ohio, enabling us thereby to catch glimpses of the prehistoric times of that great State. As was stated in a former communication, the evidence obtained through the explorations of the Bureau of Ethnology bearing upon the origin of the typical works of that State leave but little if any doubt that they were built by the ancestors of the Cherokees; but this must be understood as applying only to the circles and squares, and other works of this type, together with the mounds pertaining thereto, or bearing indications of having been built by the authors of the enclosures. The links of this chain have been gathered from the Ohio antiquities, the mounds and works of West Virginia, East Tennessee, and western North Carolina; in fact, the chain is not single, but multiple, for there are several distinct lines of evidence leading to the same conclusion. Some items bearing on this question have been published in *Science* and elsewhere, but since those appeared additional testimony has been obtained by the bureau.

But Ohio was the home of more than one mound-building tribe: there are good reasons for believing that we find here the work of six or seven different peoples or tribes: —

First, The typical works by the Cherokees, before mentioned.

Second, The walls, enclosures, and other defensive works of Cuyahoga County and other northern sections of the State. The key which will help to solve the riddle of the monuments of this type is to be found in central and western New York, the former home of the Iroquois nations: in other words, they are attributable to some branch of the Iroquois or Huron-Iroquois stock. It is possible, and even probable, that the works of Cuyahoga County are attributable to the Eries; but this, if admitted, is only another proof that this tribe pertained to the Iroquois group. The same type of works is also found in eastern Michigan as far north as Ogeman County.

Third and Fourth, The box-shaped stone graves. There is no longer any good reason for doubting that the burial-cists of this type, found in Ohio, are attributable to two tribes, — the Delawares and Shawnees; those of the central portion of the State, especially of Ashland County, marking the burial-places of Delaware Indians, and those found along the Ohio River the burial-places of Shawnees. There are, however, no marks or peculiarities by which the works of the two tribes in this State can be distinguished from each other. As but few graves of this type are found in mounds

in Ohio, it is more than probable that they belong to the time of the later occupancy of this region by these tribes. Nevertheless there are some reasons for believing that some of the works in Hamilton County pertain to an earlier occupancy of that section by the Shawnees; but this point cannot be satisfactorily settled until further explorations have been made in adjoining portions of Kentucky.

Fifth, Certain stone mounds, and mounds containing stone vaults or graves of a peculiar type, which it would be difficult to explain without the use of figures, which cannot be introduced here. Sepulchres of this type have been found at various points in the northern half of Kentucky, from the extreme north-east corner of the State as far west as Union County; but in Ohio they have as yet been discovered only in a few of the extreme southern counties. This type of works is peculiar, and presents a problem to which we have thus far been unable to find any clew. It is probable that the builders belonged to a tribe which has become extinct. Unless certain works in north-east Missouri, which bear some resemblance to those of the type mentioned, are attributable to the same people, no traces of them are to be found elsewhere than in the sections mentioned. Is it possible that the appellation 'Bloody Ground' is an echo which has floated down the ages from prehistoric times? These sepulchres indicate a savage life and fierce warfare with beasts of prey.

Sixth, The effigy mounds, of which some two or three only are known within the limits of Ohio. These also present a problem difficult to solve. It is possible that some sudden freak of the medicine-men or medas of some one of the tribes mentioned may have brought about the building of these strange works, but such a supposition is far-fetched and without any basis. It is more likely that a straggling clan or small tribe of the Wisconsin mound-builders, — probably belonging to the Dakotan stock, — wandering toward the south-east, left these mementos of their passage. The bird-effigies of Georgia may possibly have been built by the same people. Such breaking-away of a clan or tribe and its wandering to a distant locality is not without parallel in Indian history.

Seventh, Fortifications of that type of which Fort Ancient is an example. Although I have introduced this type under a separate number, I am inclined to attribute the principal works of the class to the builders of the typical works of the State, — the Cherokees. This is also the opinion of most of our archæologists, yet the relation between the works in some cases is not apparent. Fort Ancient is an example of this kind. Moreover, there are some indications in this instance of the influence of the white man, especially in the northern section of the work.

Omitting the last from the list, there remains clear and satisfactory evidence that the ancient works of the State are due to at least six different tribes.

CYRUS THOMAS.

Youngsville, Penn., June 25.

Distillation of Mercury at Ordinary Temperatures.

IN the physical laboratory of the United States Geological Survey a normal barometer hangs in a window-jamb about 35 centimetres from the glass of the window. As the window faces east, it has the sun until noon. The barometer-tube at and above the upper surface is 25 millimetres in diameter, and extends 6 centimetres above the mean position of that meniscus. It was observed that during the summer small globules of mercury covered the inner wall of the tube above the column, on the side farthest from the window. In the winter they collected upon the side nearest to the window. An inspection showed that the radiation from the tube was greatest toward the cool room in the summer, and toward the window and out of doors in the winter, thus keeping the side of greatest radiation slightly cooler than the mass of the reservoir, and condensing upon it some of the vapor of mercury of the Torricelli vacuum. In this way several grams were condensed and fell back in a single month, — a fact which seemed quite interesting when it is remembered that the vapor-tension of mercury at even 30° C. (86° F.) is only .06 of a millimetre. Of course, by bending the top of the tube over and downward toward the cooler side, the distillate could be collected and measured.

W. HALLOCK.

Washington, D.C., June 21.